Project proposal

Only for course Teacher						
		Needs Improvement	Developing	Sufficient	Above Average	Total Mark
Allocate mark & Percentage		25%	50%	75%	100%	5
Clarity	1					
Content Quality	2					
Spelling & Grammar	1					
Organization and Formatting	1					
Total obtained mark						
Comments						

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Course Code: SE 532 Course Name: INTRODUCTION TO ROBOTICS

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Project name: Object detecting robot (Single project)

Designation: Lecturer

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Introduction

The integration of robotics and artificial intelligence is revolutionizing various industries by automating complex and repetitive tasks. Among the most promising advancements in this field is the development of autonomous robots capable of detecting and interacting with objects in their environment. This capability has significant implications for a wide range of applications, from industrial automation and search and rescue operations to home assistance and beyond.

Project Overview

This project aims to design and develop an autonomous object detecting and navigating robot. The robot will utilize state-of-the-art machine learning algorithms to recognize and classify objects in real-time and integrate these capabilities with a robust navigation system. The primary goal is to create a versatile and adaptable robot that can autonomously perform tasks that require object detection and interaction.

Project Summary

The aim of this project is to design and develop an autonomous robot capable of detecting, identifying, and navigating towards specific objects in its environment. This project combines principles of robotics, computer vision, and artificial intelligence to create a versatile tool for various applications such as search and rescue, industrial automation, and home assistance.

Problem Statement and Motivation

Problem Statement:

In many environments, from industrial settings to households, there is a growing need for systems that can autonomously detect and interact with objects. Current solutions often lack the flexibility and autonomy needed for dynamic environments, leading to inefficiencies and increased human labor.

Motivation:

The motivation for this project stems from the potential to significantly enhance automation in various fields. An autonomous object detecting robot can:

- Reduce human effort and error in repetitive tasks.
- Increase efficiency in industrial processes.
- Assist in search and rescue operations by identifying and locating objects or victims.
- Provide assistance in home settings, particularly for individuals with disabilities.

Project Idea

The project aims to design and develop an autonomous robot equipped with advanced object detection capabilities. The robot will use machine learning algorithms to identify and classify objects in real-time. It will integrate these detection capabilities with a navigation system, enabling it to move towards and interact with the identified objects autonomously.

Key features include:

- Object Detection: Utilizing deep learning models to recognize and classify objects.
- Autonomous Navigation: Implementing path planning and obstacle

avoidance algorithms to navigate towards detected objects.
- Real-Time Processing: Ensuring the robot can process visual data and respond instantly.
- User Interface: Developing a simple interface for monitoring and controlling the robot.

Components Required

Hardware Components:

- Robotic Chassis: A mobile base with wheels or tracks.
- Cameras: High-resolution cameras for object detection.
- LIDAR/Ultrasonic Sensors: For distance measurement and obstacle detection.
- Microcontroller/Single Board Computer: Raspberry Pi or Arduino for processing.
- Motors and Motor Drivers: For movement control.
- Battery Pack: To power the robot.
- GPS Module (Optional): For outdoor navigation.

Software Components:

- Object Detection Algorithms: Using frameworks like TensorFlow or PyTorch.
- Navigation Algorithms: Using Robot Operating System (ROS) for path planning.
- Control Software: Custom software for integrating detection and navigation.
- User Interface: Web or mobile application for monitoring.
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Miscellaneous:

- Cables and Connectors: For hardware assembly.
- Mounting Hardware: To securely attach sensors and components.

Expected Outcome

The successful completion of this project will result in a functional autonomous robot capable of:

- Accurately detecting and classifying various objects in its environment.
- Navigating towards the detected objects while avoiding obstacles.
- Performing these tasks in real-time, demonstrating practical applications in dynamic settings.
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Specific Deliverables:

- Prototype Robot: Fully assembled and functional robot with integrated detection and navigation systems.
- Software Package: Source code for object detection, navigation, and control interfaces.
- User Documentation: Instructions for setup, operation, and maintenance of the robot.
- Performance Report: Detailed evaluation of the robot's accuracy, speed, and reliability in various test scenarios.

Conclusion

The development of an object detecting robot is a significant step towards enhancing automation in various fields. This project promises to deliver a functional prototype that can serve as a foundation for future enhancements and applications. The successful completion of this project will not only demonstrate the feasibility of such systems but also pave the way for more advanced autonomous robots.

References:

Relevant academic papers, textbooks, and online resources on robotics, computer vision, and AI.
Documentation from hardware and software components used in the project.